

Lynx risk factors

The LCAS identified the following risk factor categories that could affect lynx:

- ♦ *Productivity*
- ♦ *Mortality*
- ♦ *Movement*

This analysis evaluates how the alternatives affect these risk factors and to what degree.

Productivity risk factors

In the biological sense, *productivity* means the ability of an organism to successfully reproduce. Successful reproduction involves not only giving birth, but also whether the offspring survive into maturity, themselves capable of reproducing.

Lynx productivity is directly related to the quantity and quality of habitat and indirectly related to competition with predators. Productivity risk factors are:

- ♦ *Foraging habitat*
- ♦ *Denning habitat*
- ♦ *Competition from other predators*

This analysis focuses on the risks to foraging and denning habitat, and evaluates how competition from predators affects productivity.

A considerable amount of lynx research has been conducted in Alaska and Canada (Ruggiero et al. 2000a), documenting certain habitat needs and relationships. Research is also underway in the contiguous United States. See Appendix F for a summary.

Foraging habitat

Lynx foraging habitat is defined as habitat that supports snowshoe hares or red squirrels (Ruediger et al. 2000).

Red squirrel habitat consists primarily of older, closed-canopied forests with substantial quantities of coarse woody debris.

Snowshoe hare habitat consists of places where young trees or shrubs grow densely, often thousands of woody stems per acre. Many studies have shown hares prefer dense stands (Fuller 1999; Hodges 2000a; Hodges 2000b; McKelvey and McDaniel 2001; Shaw 2002). During summer, snowshoe hares forage on forbs, grasses and small shrubs.

During winter, hare forage is limited to the twigs and stems that protrude above the snow and the hares can reach. *Since snowshoe hare forage is more limited during winter and hares are lynx primary winter prey, this analysis focuses on the effects of the alternatives to winter snowshoe hare habitat.*

The terms *foraging habitat* and *winter snowshoe hare habitat* are used interchangeably in this analysis.

Vegetation that provides hares with hiding cover is also important.

Winter snowshoe hare habitat occurs in three stages of forest development, the *stand initiation*, *understory reinitiation* and *old forest multistoried* structural stages.

Stand structural stages

Figure 3-2. Vegetative structural stages and lynx habitat components

Structural stage	Description	Contribution to lynx habitat
Stand initiation, or young regenerating forests	After a stand replacing fire or regeneration harvest, new seedlings establish and develop. A single- story layer of shrubs, tree seedlings and saplings grow.	<i>Unsuitable habitat</i> for about the first ten to 30 years after disturbance because the trees and shrubs are not tall enough to protrude above the snow. <i>Winter snowshoe hare habitat</i> after about ten to 30 years, if trees are dense enough and tall enough to protrude above the snowline in places that get deep snow.

**Winter
snowshoe
hare habitat**



Trees initially may grow fast, slowing
down as they compete for sunlight
and moisture. There's limited
understory because little light reaches
the forest floor.

Generally, not denning or hare
habitat because the live tree crowns
are too tall, and the understory and
dead and down material too limited.

Stem exclusion



Structural stage

Description

Contribution to lynx habitat

In this stage, three or more tree layers become established after minor disturbances kill some overstory trees.

Generally not winter snowshoe hare habitat because only a limited understory has developed within the reach of snowshoe hares.

Denning habitat if there's a large amount of coarse woody material.

Young forest
multistoried

Not winter
snowshoe hare
habitat



As the forest ages, some overstory trees begin to die or are removed, making openings where a new generation of understory trees can grow in a multistoried condition.

Winter snowshoe hare habitat if the understory is dense enough to provide cover and forage, and is within reach of hares.

Denning habitat if there is a large amount of coarse woody material.

Understory
reinitiation,
one of the
older
multistoried
forests

**Winter
snowshoe
hare habitat**



Structural stage

Description

Contribution to lynx habitat

Many generations and vegetation layers mark this structural class. It usually contains large old trees; decaying falling trees may be present, and it has no understory.

Generally not winter snowshoe hare habitat because it lacks the small understory trees that provide cover and forage for snowshoe hares.

Old forest –
single storied



Some old forests develop a multistoried structure with an understory.

Winter snowshoe hare habitat if understory is dense enough to provide cover and forage, and is within the reach of hares.

Denning habitat because it generally provides plenty of large coarse woody material.

*Old forest –
multi storied,
the other older
multistoried
forest*

***Winter
snowshoe
hare habitat***



Adapted from Oliver and Larson, 1996

Where & how winter snowshoe hare habitat

occurs

High densities of young trees and shrubs occur in different stages of forest development – see Figure 3-3.

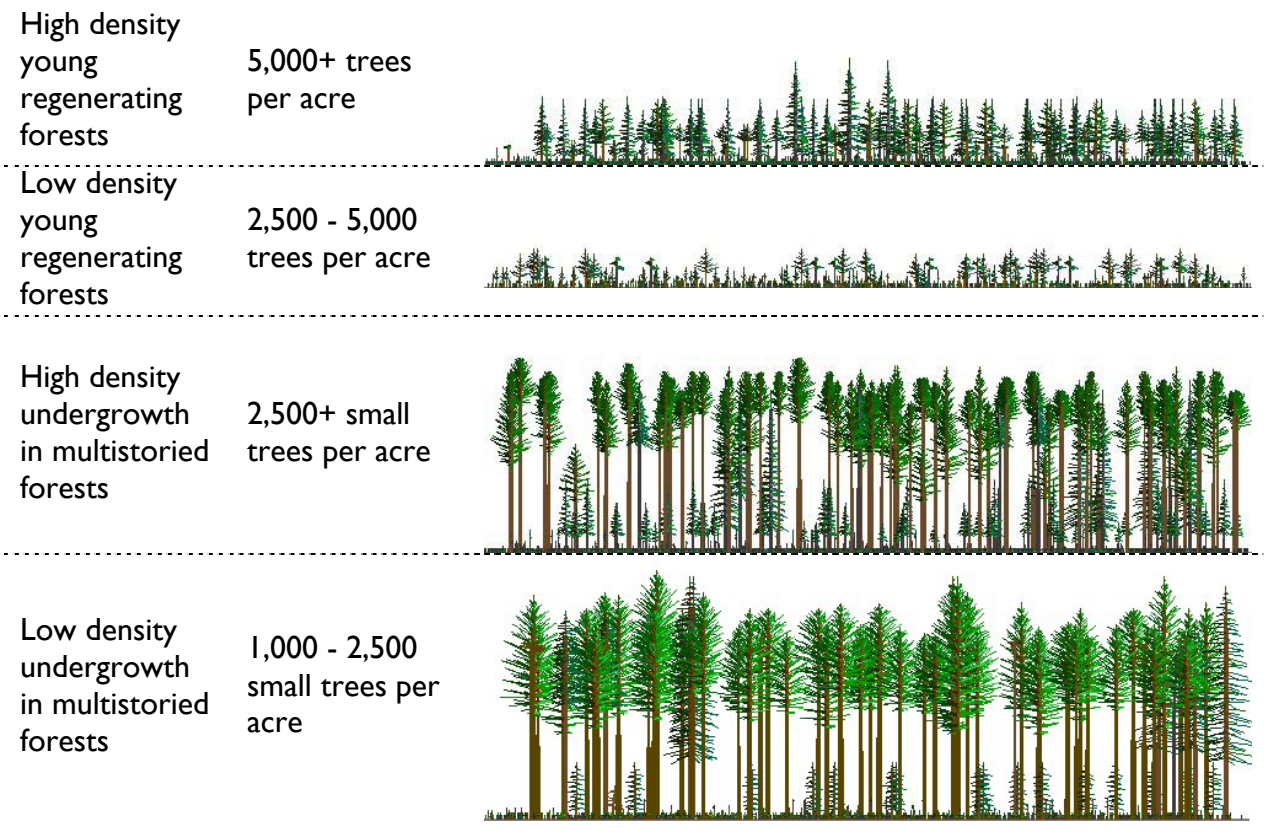
The *stand initiation stage* consists of young regenerating forests when the trees are all about the same age and size. Generally, about ten to 30 years after disturbance trees grow tall enough to provide good winter snowshoe hare habitat. Stand replacing fire and regeneration timber harvests can create these conditions.

Unsuitable lynx habitat consists of young regenerating forests when the trees and brush are generally less than ten to 30

years old and have not yet grown tall enough to protrude above the snow in winter. As time passes, the trees will grow taller and may provide *winter snowshoe hare habitat* if dense enough. Later, they'll grow too tall and will be out the reach of snowshoe hares in winter.

The *understory reinitiation* and *old forest multistoried* are later stages in the life cycle of a forest. As the forest ages, tree heights begin to vary greatly, creating *multistoried forests*. Multistoried forests can provide winter snowshoe hare habitat in places where small trees and shrubs grow thick enough to support snowshoe hares. Multistoried forests are often good snowshoe hare habitat and may be used

Figure 3-3. Describing high and low density winter snowshoe hare habitat



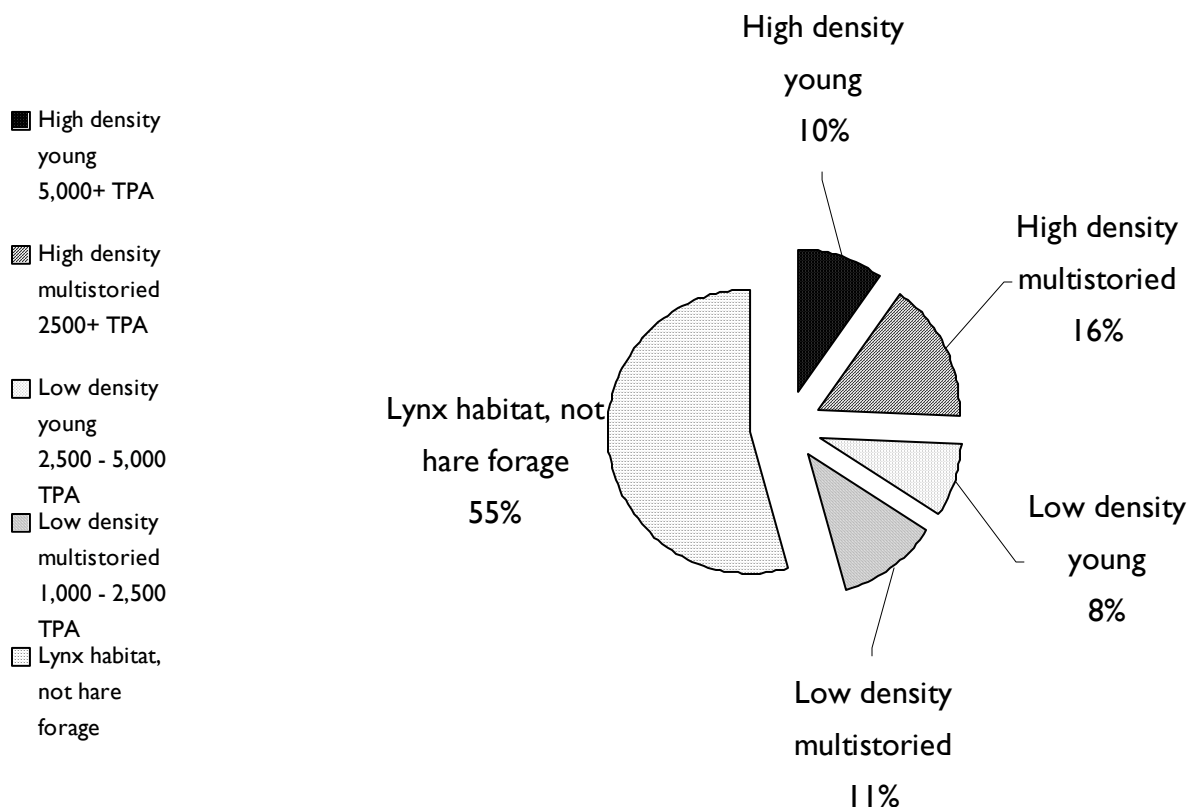
more in winter than dense young stands (Hodges, pers. com.; Squires, pers. com.)

Multistoried forest structures can develop from natural processes, such as insects and diseases and fire, or management actions like timber harvest can create small openings where trees and shrubs can grow.

For the purposes of this analysis, FIA data for Montana was used as a proxy for winter snowshoe hare habitat. The analysis evaluated how many acres of multistoried and young regenerating forests have an abundance of small trees per acre.

- ♦ It's likely young regenerating forests with 5,000 or more trees per acre less than five inches in diameter provide good foraging habitat (Ruggerio et al. 2000).
- ♦ Young regenerating forests with 2,500-5,000 trees per acre less than five inches in diameter may also provide foraging habitat depending on how the trees are distributed. Young forests with fewer trees may not provide enough cover for snowshoe hares.
- ♦ Multistoried forests with 2,500 or more trees per acre less than five inches in diameter also may provide good

Figure 3-4. Winter snowshoe hare habitat in Montana



Percentages shown are the percent of lynx habitat

foraging habitat where small trees occur in dense, irregular clumps underneath the overstory.

- ♦ Multistoried forests with 1,000 to 2,500 acre less than five inches in diameter may also provide good foraging habitat, depending on how the trees are distributed. Multistoried forests with less than 1,000 trees per acre may not provide enough cover for snowshoe hares.

Lynx evolved to adapt to an ever-changing forest condition. They require a mosaic of conditions of appropriate species composition, varying stand ages, and structure to support abundant snowshoe hare and lynx denning habitat. In addition, lynx are highly mobile, moving long distances to find abundant prey, and use a large area on the landscape as demonstrated by the large size of an average lynx home range (USDI FWS, 2003).

Table 3-2. Winter snowshoe hare habitat in Montana

	<u>Area</u>	<u>Percent lynx habitat†</u>	<u>Percent NF lands‡</u>
Unsuitable habitat	~ 900,000 acres	10%	- - -
Winter snowshoe hare habitat	4,120,000 acres	45%	24%
<u>HIGH DENSITY</u>			
Total high density	2,353,000 acres	26%	14%
Young regenerating forests, with at least 5,000 trees per acre			
Wilderness	143,000 acres	2%	1%
Outside wilderness	757,000 acres	8%	4%
Total	900,000 acres	10%	5%
Multistoried forests, with at least 2,500 trees per acre			
Wilderness	368,000 acres	4%	2%
Outside wilderness	1,085,000 acres	12%	6%
Total	1,453,000 acres	16%	8%
<u>LOW DENSITY</u>			
Total low density	1,767,000 acres	19%	10%
Young regenerating forests, with from 2,500 to 5,000 trees per acre			
Wilderness	198,000 acres	2%	1%
Outside wilderness	553,000 acres	6%	3%
Total	751,000 acres	8%	4%
Multistoried forests, with from 1,000 to 2,500 trees per acre			
Wilderness	197,000 acres	2%	1%
Outside wilderness	819,000 acres	9%	5%
Total	1,016,000 acres	11%	6%

† 9,060,000 acres of lynx habitat in Montana

‡ 17,454,000 acres of National Forest lands in Montana

The amount of winter snowshoe hare habitat may be overstated because variables, such as the size of openings and location, cannot be modeled – see the discussion of analysis tools on pages 3-4 & 3-5.

A distribution of *age classes* is important so there are always parts of each LAU providing winter snowshoe hare habitat. Montana contains 9,060,000 acres of lynx habitat. About ten percent is in unsuitable condition. Over time, some unsuitable habitat may develop into winter snowshoe hare habitat (Hillis et al. 2003). About 26 percent of the lynx habitat on NF lands in Montana has a high density of small trees and may provide good winter snowshoe hare habitat. An additional 19 percent may provide lower density habitat for snowshoe hares. Whether or not this additional area actually provides good snowshoe hare habitat depends on site-specific conditions like the tree species and spacing. See Table 3-2 on page 3-16 and Figure 3-4 on page 3-15.

The amount of young regenerating forests and unsuitable habitat is likely less extensive than it was historically because so many wildfires have been suppressed during the last 80 years (Hillis et al. 2003). At the same time, fire suppression may have increased the amount of winter snowshoe hare habitat available in older multistoried forests.

Foraging habitat risks

Lynx productivity depends on the quantity and quality of foraging habitat. Foraging habitat may be affected by:

- ♦ Landscape patterns
- ♦ Precommercial thinning
- ♦ Other vegetation management practices
- ♦ Grazing

Landscape pattern risks to foraging habitat

Timber harvest, fire, insect outbreaks, avalanches and wind all change landscape patterns. Fire plays an important role in lynx habitat. Stand-replacing fires burn mature forests and result in young regenerating forests.

Fire suppression can limit the creation of winter snowshoe hare habitat. Timber harvest creates young regenerating or multistoried forests.

Both fire and timber harvest can create unsuitable habitat, where the brush and trees are not yet tall enough to protrude above the snow. In some areas, too much unsuitable habitat may be created and in other places, not enough.

- ♦ In *non-developmental allocations*, because of fire suppression, the large fires that used to burn have been fewer and smaller, so less foraging habitat has been created. Natural fires are allowed to burn but may not mimic historic fire patterns because of human concerns about large fires (Hickenbottom et al. 1999).
- ♦ In *developmental allocations*, where timber sales are allowed, regeneration timber harvest (where almost all the big trees are cut) can result in young regenerating forests (Ruggiero et al. 2000a). Studies of lynx and snowshoe hare have documented lynx presence and reproduction and snowshoe hare abundance in a variety of managed landscapes (USDI FWS, 2003).

How sites are reforested can also change landscape patterns. Sometimes lodgepole pine is removed and western larch is planted or otherwise encouraged to grow, converting the forest from one predominant tree species to another – this is called a *type conversion*. Western larch may not provide winter forage for hares because it loses its needles and may not provide the vegetative cover hares need during winter.

Precommercial thinning risks to foraging habitat

Precommercial thinning reduces stem densities to increase the growth of the remaining trees. Precommercial thinning generally occurs when forests are 15 to 25 years old, about the same time young regenerating forests are beginning to provide winter snowshoe hare habitat.

Precommercial thinning may reduce stem densities and cover to the point that the

young forests have little or no value for snowshoe hares (Ruggiero et al. 2000a).

Other vegetation management risks to foraging habitat

In multistoried forests, some fuel treatments and commercial timber sales may reduce winter snowshoe hare habitat because the small trees and brush that constitute foraging habitat are removed. Other projects may remove only tall trees and create openings, allowing new foraging habitat to develop.

Grazing risks to foraging habitat

Livestock grazing may reduce or eliminate foraging habitat in areas that grow quaking aspen and willow in riparian areas (Ruediger et al. 2000). These localized changes in habitat may affect individual lynx; however no information indicates that grazing poses a threat to overall lynx populations (USDI FWS, 2003, p. 40083).
